PROSPECTING AND MINING SPACE RESOURCES: PLANETARY RESOUCES' OUTLOOK AND THE PLANETARY SCIENCE IMPACT. C. Lewicki, K. J. Bradford, E. A. Frank, and M. Beasley[1], [1]Planetary Resources, Inc., 6742 185th Ave NE, Redmond, WA 98052.

Introduction: Over the next 35 years, scientific exploration of the Solar System has the potential to expand beyond being a predominantly publicly funded activity to include privately financed business ventures. Private finance can serve to accelerate research & development, fund interplanetary missions, and generate scientific data. This contribution of the private sector to space exploration can provide new data about the solar system beyond that from the normal cadence of government-funded missions.

Planetary Resources is leading the way in bringing private finance to planetary science with the aim of prospecting and mining Near-Earth Asteroids (NEAs). Beyond the business opportunity of extracting and selling space resources, the knowledge generated from our efforts will expand humanity's understanding of solar system evolution, provide further context for the diversity of meteorite parent bodies, and contribute to strategies for planetary defense.

To achieve its goals, Planetary Resources' vision for the next 35 years in asteroid resource science includes strong private-public partnerships and close collaborations with the planetary science community.

Science of Asteroid Prospecting: Prospecting NEAs is a necessary precursor to any mining expedition. The technologies, instrumentation, and data products of prospecting missions have significant overlap with traditional science-driven planetary exploration missions. The key goals of prospecting are the quantification of resources on a NEA and measurements that feed into the engineering design of a mining operation. Specifically, successful prospecting missions must produce geochemical and geophysical knowledge of the target.

The first mining goal of Planetary Resources is the extraction of water for fuel. Therefore understanding the abundance and distribution of water (in any of its forms) on an asteroid is essential and necessitates instrumentation similar to that found on a traditional planetary science mission. However, Planetary Resources will be more constrained by cost and efficiency than government-funded missions. Thus, Planetary Resources is already innovating to make smaller, more cost effective scientific instrumentation to support prospecting efforts.

The long-term mining goal of Planetary Resouces is the extraction of both industrial and rare materials. Similar to water prospecting, asteroid composition and homogeneity will be crucial metrics for determining the commercial value of any asteroidal resources. Likewise the instrumentation required for such prospecting activites is similar in function to instruments found on planetary missions.

For both the near-term and long-term goals of the company, knowledge of asteroid structure and regolith properties will be essential for informing mine operations at the asteroid. The instrumentation needed for such measurements is a combination of technologies with space heritage and technologies currently under development at Planetary Resources and elsewhere.

Although not driven exclusively by science, Planetary Resources' asteroid prospecting will create data valuable to the planetary science community. The resulting data could include compositional mapping, indications of hydration state, geophysical models, measurements of mechanical strength, and constraints on the regolith environment.

Partnerships and Collaborations: Planetary Resources will actively engage with the planetary science community in order to utilize the expertise required to develop a prospecting mission and interpret returned data products. The scope and nature of such partnerships will continue to evolve over time, but will likely continue to include joint research & development efforts, educational training in the form of student internship opportunities, and job opportunities for planetary scientists.

In the near future, Planetary Resources sees collaborations with planetary scientists expanding to include sharing data collected from asteroid prospecting missions. Given the commercial motivations of prospecting, a framework must be developed that will allow the planetary science community to benefit from prospecting data while allowing Planetary Resources to keep certain information proprietary as to remain competitive. The company is looking to work with the community to develop that framework in advance of the first prospecting mission.

Summary: Planetary Resources is working to bring commercial financing to planetary missions. The nature of prospecting missions has significant overlap with traditional exploration missions, and thus may generate valuable scientific data. Planetary Resources will continue to engage with the planetary science community to facilitate partnerhips and collaborations that will benefit both science and commercial opportunites in space.